CLAIMS

1 A power converter apparatus comprising a multi-resonant circuit comprising a series-resonant circuit and a frequency-dependent impedance connected in series with the series-resonant circuit and operative to counteract an inductance of the series-resonant circuit, a switching circuit operative to alternately apply first and second voltages to an input of the multi-resonant circuit, and a rectifier circuit coupled to an output of the multi-resonant circuit.

2. A power converter apparatus according to claim 1, wherein the frequency-dependent impedance decreases with an increase in frequency at which the first and second voltages are applied to the multi-resonant circuit.

3. A power converter apparatus according to claim 1 or claim 2, wherein the frequency-dependant impedance comprises a second series-resonant circuit.

4. A power converter apparatus, comprising:

a multi-resonant circuit comprising cascaded first and second series-resonant stages having respective first and second resonant frequencies;

a switching circuit operative to alternately apply first and second voltages to an input of the multi-resonant circuit; and

a rectifier circuit coupled to an output of the multi-resonant circuit.

5. An apparatus according to claim 3 or 4, wherein the first resonant frequency is less that the second resonant frequency.

6. An apparatus according to claim 5, wherein the first series-resonant stage is configured to allow the second series-resonant stage to operate at the second resonant frequency while maintaining inductive loading of the switching circuit.

7. An apparatus according to any of claims 3 to 5, further comprising a clamping circuit coupled to the multi-resonant circuit and operative to limit a voltage at the output of the multi-resonant circuit.

8. An apparatus according to claim 7, wherein the clamping circuit is configured to limit capacitive loading of the switching circuit by the second series-resonant stage.

9. An apparatus according to any one of claims 3 to 5 or 7, wherein the first and second resonant stages comprise respective series combinations of a capacitor and an inductor.

10. An apparatus according to claim 9, wherein the inductors of the first and second series-resonant stages comprise an inductance of a primary winding of a transformer, and wherein the rectifier circuit is coupled to a secondary winding of the transformer.

11. An apparatus according to any one of claims 3 to 5 or 7 or 9, wherein the first and second series-resonant stages comprise an inductance of primary winding of a transformer, and wherein the rectifier circuit is coupled to a secondary winding of the transformer.

12. An apparatus according to any one of claims 3 to 5, 7, 9 or 11 :

wherein the switching circuit is operative to alternately couple first and second terminals of a DC power source to an input of the multi-resonant circuit; and

wherein the multi-resonant circuit comprises:

a first capacitor having a first terminal coupled to the switching circuit;

an inductor having a first terminal coupled to a second terminal of the first capacitor; and

a second capacitor having a first terminal coupled to a second terminal of the inductor and a second terminal configured to be coupled to one of the first and second terminals of the DC power source.

13. An apparatus according to claim 12, wherein the second capacitor comprises two capacitors configured to be coupled between the second terminal of the inductor and respective ones of the first and second terminals of the DC power source.

14. An apparatus according to any one of claims 3 to 5, 7, 9, 11 or 12:

wherein the mu1ti-resonant circuit comprises a series combination of a first capacitor, first and second primary windings of respective first and second transformers, and a second capacitor; and

wherein the rectifier circuit comprises a self -driven synchronous rectifier circuit coupled to first and second secondary windings of the first and second transformers.

15. An apparatus according to any one of claims 3 to 5, 7, 9, 11 or 12:

wherein the multi-resonant circuit comprises a series combination of a first capacitor, first and second primary windings of respective first and second transformers, and a second capacitor; and

wherein the rectifier circuit comprises a diode rectifier circuit coupled to first and second secondary windings of the first and second transformers.

16. An apparatus according to any one of the preceding claims, wherein the switching circuit comprises a half-bridge circuit.

17. A power conversion method, comprising alternatively applying first and second voltages to an input of a multi-resonant circuit comprising a series-resonant circuit and a frequency-dependant impedance connected in series with the series-resonant circuit and operative to counteract an inductance of the series-resonant circuit; and responsively generating a DC voltage from a voltage at the output of the multi-resonant .

18. A power conversion method according to claim 17, wherein the frequency-dependant impedance comprises a second series-resonant circuit.

19. A power conversion method according to claim 17 or claim 18, wherein the frequency-dependant impedance decreases in frequency at which the first and second voltages are applied to the multi-resonant circuit.

20. A power conversion method, comprising:

alternately applying first and second voltages to an input of a multi-resonant circuit comprising cascaded first and second series-resonant stages having respective first and second resonant frequencies; and

responsively generating a DC voltage from a voltage at the output of the multi- resonant circuit.

21. A method according to any of claims 18 to 20, wherein the first resonant frequency is less that the second resonant frequency.

22. A method according to any of claims 18 to 21, wherein the first and second resonant stages comprise respective series combinations of a capacitor and an inductor.

23. A method according to claim 22, wherein the inductors of the first and second resonant stages comprise a primary winding of a transformer, and wherein generating a DC voltage comprises generating the DC voltage from a voltage on a secondary winding of the transformer.

24. A method according to any one of claims 18 to 22, wherein the multi-resonant circuit comprises:

a first capacitor having a first terminal coupled to the switching circuit;

an inductor having a first terminal coupled to a second terminal of the first capacitor; and

a second capacitor having a first terminal coupled to a second terminal of the inductor and a second terminal configured to be coupled to one of the first and second terminals of the DC power source.

25. A method according to any one of claims 18 to 22 or 24:

wherein the multi-resonant circuit comprises a series combination of a first capacitor, first and second primary windings of first and second transformers and a second capacitor; and

wherein the generating a DC voltage comprises generating the DC voltage from a self-driven synchronous rectifier circuit coupled to first and second secondary windings of the first and second transformers.

26. A power converter apparatus according to claim 1 and substantially as herein before described.

27. A power conversion method according to claim 17 and substantially as herein before described.